10/644,565

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PTO/SB/21 (09-04)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission

Application Number	10/644,565
Filing Date	08/15/2003
First Named Inventor	Ian MOORE
Art Unit	2862
Examiner Name	V. TAYLOR
Attorney Docket Number	594-25598-US

ENCLOSURES *(Check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment/Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Reply to Missing Parts/ Incomplete Application
  - ☐ Reply to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert to a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
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- ☐ CD, Number of CD(s) _____
  - ☐ Landscape Table on CD
- ☐ After Allowance Communication to TC
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- ☐ Proprietary Information
- ☐ Status Letter
- ☑ Other Enclosure(s) (please Identify below):

Request for Certificate of Correction and related documents

Certificate

JAN 0 3 2005

of Correction

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	WesternGeco, L.L.C.		
Signature			
Printed name	Jeffrey E. Griffin		
Date	12/28/2004	Reg. No.	36,534

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:

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(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,832,161 B1

DATED : 14 December 2004

INVENTOR(S) : Ian Moore

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

The United States Patent and Trademark Office has made a typographical error in this patent as follows:

In Claim 1, Line 14 reads:

"applying the convolutional operator me second modi-"

should read:

"applying the convolutional operator to the second modi-"

X _____

Jeffrey E. Griffin
Registration Number 36,534

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PATENT NO. 6,832,161 B1

No. of additional copies

- 6 JAN 2005

CLAIM SHEET AS ORIGINALLY FILED WITH THE USPTO

What Is Claimed Is:

1. A method for attenuating water layer multiples from a gather of seismic data traces, comprising:

predicting a plurality of receiver side water layer multiples in the gather of seismic data traces using a convolutional operator derived from a water layer model;

adaptively subtracting the receiver side water layer multiples from the gather of seismic data traces;

predicting a plurality of source side water layer multiples using the convolutional operator derived from the water layer model; and

adaptively subtracting the receiver side water layer multiples and the source side water layer multiples from the gather of seismic data traces to generate a plurality of primaries in the gather of seismic data traces.

2. The method of claim 1, wherein predicting the plurality of receiver side water layer multiples comprises:

forming the gather of seismic data traces in a t-x domain;

transforming the gather of seismic data traces from the t-x domain to a tau-p domain; and

convolving the gather of seismic data traces with a convolutional operator to predict the receiver side water layer multiples.

3. The method of claim 2, wherein predicting the source side water layer multiples comprises:

removing a water bottom primary from the gather of seismic data traces; and

convolving the convolutional operator with the gather of seismic data traces after the receiver side water layer multiples have been adaptively subtracted from the gather of seismic data traces and after the water bottom primary has been removed from the gather of seismic data traces to predict the source side water layer multiples.

FIRST PRELIMINARY AMENDMENT AS FILED WITH THE USPTO ON 08 SEPTEMBER 2003

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Ian Moore

Serial No.: 10/644,565

Filed: August 15, 2003

Confirmation No.: Unknown

For: Method For Attenuating Water Layer Multiples

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§ Group Art Unit: Unknown
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§ Examiner: Unknown
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MAIL STOP NON-FEE AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

CERTIFICATE OF MAILING
37 CFR 1.8
I hereby certify that this correspondence is being deposited on September 8, 2003 with the United States Postal Service as First Class Mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450 Alexandria, VA 22313-1450.

September 8, 2003
Date

Signature

Dear Sir:

PRELIMINARY AMENDMENT

Prior to examination, please enter the amendments to the claims made herein. The amendments to the claims are reflected in the listing of claims which begins on page 2 of this paper. Remarks/Arguments begin on page 7 of this paper.

In the Claims:

Please cancel claims 18-20 without prejudice, add new claims 21-23 and amend the rest of the claims as follows:

1. (Currently Amended) A method for attenuating water layer multiples from a gather of seismic data traces, comprising:

applying a convolutional operator to the gather of seismic data traces to predict ~~predicting~~ a plurality of receiver side water layer multiples contained in the gather of seismic data traces ~~using a convolutional operator derived from a water layer model~~;

adaptively subtracting the receiver side water layer multiples from the gather of seismic data traces to generate a modified version of the gather of seismic data traces;

removing a water bottom primary from the modified version of the gather of seismic data traces to create a second modified version of the gather of seismic data traces;

applying the convolutional operator to the second modified version of the gather of seismic data traces to predict ~~predicting~~ a plurality of source side water layer multiples contained in the gather of seismic data traces ~~using the convolutional operator derived from the water layer model;~~ and

adaptively subtracting the receiver side water layer multiples and the source side water layer multiples from the gather of seismic data traces to generate a plurality of primaries contained in the gather of seismic data traces.

2. (Currently Amended) The method of claim 1, wherein applying the convolutional operator to the gather of seismic data traces to predict ~~predicting~~ the plurality of receiver side water layer multiples comprises:

forming the gather of seismic data traces in a t-x domain;

transforming the gather of seismic data traces from the t-x domain to a tau-p domain; and

convolving the gather of seismic data traces with a the convolutional operator to predict the receiver side water layer multiples.

3. (Currently Amended) The method of claim [2] 1, wherein applying the convolutional operator to the second modified version of the gather of seismic data traces to predict ~~predicting~~ the source side water layer multiples comprises:

~~removing a water bottom primary from the gather of seismic data traces; and~~

convolving the convolutional operator with the second modified version of the gather of seismic data traces ~~after the receiver side water layer multiples have been adaptively subtracted from the gather of seismic data traces and after the water bottom primary has been removed from the gather of seismic data traces~~ to predict the source side water layer multiples.

4. (Original) The method of claim 2, wherein the gather of seismic data traces is transformed to the tau-p domain using a linear Radon transform.

5. (Currently Amended) The method of claim [3] 2, ~~further comprising~~ wherein adaptively subtracting the receiver side water layer multiples and the source side water layer multiples from the gather of seismic data traces comprises:

adding the receiver side water layer multiples to the source side water layer multiples; and

transforming the sum of the receiver side water layer multiples and the source side water layer multiples from the tau-p domain to the t-x domain.

6. (Currently Amended) The method of claim 5, wherein adaptively subtracting the receiver side water layer multiples and the source side water layer multiples from the gather of seismic data traces comprises adaptively subtracting the sum of the receiver side water layer multiples and the source side water layer multiples in the t-x domain to generate the primaries contained in the gather of seismic data traces in the t-x domain.

7. (Currently Amended) The method of claim [3] 1, wherein removing the water bottom primary comprises replacing each amplitude associated with the water bottom primary with zero.

8. (Currently Amended) The method of claim [3] 5, wherein the sum of the receiver side water layer multiples and the source side water layer multiples is transformed to the t-x domain using an inverse linear Radon transform.

9. (Original) The method of claim 1, wherein the convolutional operator is computed using a zero offset two-way travel time in a water layer and a reflectivity at a water bottom estimated from the water layer model.

10. (Original) The method of claim 9, wherein the convolutional operator is the estimated value of the water bottom reflectivity shifted in time by the estimated value of the travel time in the water layer in the tau-p domain.

11. (Currently Amended) A method for attenuating water layer multiples from a gather of seismic data traces, comprising:

forming the gather of seismic data traces in a t-x domain;

transforming the gather of seismic data traces from the t-x domain to a tau-p domain;

convolving the gather of seismic data traces with a convolutional operator to predict a first set of water layer multiples contained in the gather of the seismic data traces;

adaptively subtracting the first set of water layer multiples from the gather of seismic data traces;

removing a water bottom primary from the gather of seismic data traces;

convolving the convolutional operator with the gather of seismic data traces after the first set of water layer multiples has been adaptively subtracted from the seismic data traces and after the water bottom primary has been removed from the gather of seismic data traces to predict a second set of water layer multiples contained in the gather of seismic data traces;

adding the first set of water layer multiples to the second set of water layer multiples;

transforming the sum of the first set of water layer multiples and the second set of water layer multiples from the tau-p domain to the t-x domain; and

adaptively subtracting the transformed sum of the first set of water layer multiples and the second set of water layer multiples from the gather of seismic data traces in the t-x domain to generate a plurality of primaries contained in the gather of seismic data traces.

12. (Currently Amended) The method of claim 11, wherein the first set of water layer multiples comprises one or more receiver side water layer multiples.

13. (Currently Amended) The method of claim 11, wherein the second set of water layer multiples comprises one or more source side water layer multiples.

14. (Currently Amended) The method of claim 11, wherein removing the water bottom primary comprises replacing each amplitude associated with the water bottom primary with zero.

15. (Currently Amended) The method of claim 11, wherein the plurality of seismic data traces is transformed to the tau-p domain using a linear Radon transform.

16. (Currently Amended) The method of claim 11, wherein the convolutional operator is derived from a water layer model.

17. (Currently Amended) The method of claim 11, wherein the convolutional operator is derived from a zero offset two-way travel time in the water layer and reflectivity at a water bottom estimated from a water layer model.

18. (Cancelled)

19. (Cancelled)

20. (Cancelled)

21. (New) The method of claim 1, wherein the convolutional operator is derived from a water layer model.

22. (New) The method of claim 17, wherein the convolutional operator is the estimated value of the water bottom reflectivity shifted in time by the estimated value of the travel time in the water layer in the tau-p domain.

23. (New) A method for attenuating water layer multiples from a gather of seismic data traces, comprising:

forming the gather of seismic data traces in a t-x domain;

transforming the gather of seismic data traces to a tau-p domain;

applying a convolutional operator to the gather of seismic data traces to predict a plurality of receiver side water layer multiples contained in the gather of seismic data traces;

adaptively subtracting the receiver side water layer multiples from the gather of seismic data traces to generate a modified version of the gather of seismic data traces;

removing a water bottom primary from the modified version of the gather of seismic data traces to create a second modified version of the gather of seismic data traces;

applying the convolutional operator to the second modified version of the gather of seismic data traces to predict a plurality of source side water layer multiples contained in the gather of seismic data traces;

adding the receiver side water layer multiples to the source side water layer multiples;

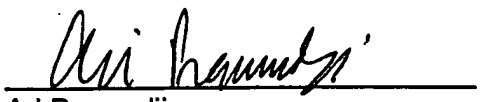
transforming the sum of the receiver side water layer multiples and the source side water layer multiples from the tau-p domain to a t-x domain; and

adaptively subtracting the receiver side water layer multiples and the source side water layer multiples from the gather of seismic data traces to generate a plurality of primaries contained in the gather of seismic data traces.

REMARKS

Applicant requests that the Examiner enter the amendment prior to examining the above identified application. Claims 18-20 have been cancelled without prejudice. Claims 1-3, 5-8 and 11-17 have been amended and new claims 21-23 have been added to more clearly recite various aspects of the invention. No new matter has been introduced by the amendments and the new claims presented herein. The amendments and the new claims have been made in a good faith effort to advance the prosecution on the merits.

Respectfully submitted,



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SECOND PRELIMINARY AMENDMENT AS FILED WITH THE USPTO ON 22 JULY 2004

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Ian Moore

Serial No.: 10/644,565

Filed: August 15, 2003

Confirmation No.: 6947

For: Method For Attenuating Water Layer Multiples

Group Art Unit: 2862

Examiner: V. Taylor

MAIL STOP NON-FEE AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

CERTIFICATE OF FACSIMILE TRANSMISSION UNDER 37 CFR 1.8
I hereby certify that this correspondence and the documents referred to as attached therein are being facsimile transmitted to the U.S. Patent and Trademark Office to the fax number indicated by the Examiner, namely, fax number 571-273-2281 to the attention of the named Examiner, on the date below.

July 20, 2004
Date

Signature

SECOND PRELIMINARY AMENDMENT

Prior to examination, please enter amendments to the claims made herein. The amendments to the claims are reflected in the listing of claims which begins on page 2 of this paper. Remarks/Arguments begin on page 7 of this paper.

In the Claims:

Please amend the claims as follows:

1. (Previously Amended) A method for attenuating water layer multiples from a gather of seismic data traces, comprising:

applying a convolutional operator to the gather of seismic data traces to predict a plurality of receiver side water layer multiples contained in the gather of seismic data traces;

adaptively subtracting the receiver side water layer multiples from the gather of seismic data traces to generate a modified version of the gather of seismic data traces;

removing a water bottom primary from the modified version of the gather of seismic data traces to create a second modified version of the gather of seismic data traces;

applying the convolutional operator to the second modified version of the gather of seismic data traces to predict a plurality of source side water layer multiples contained in the gather of seismic data traces; and

adaptively subtracting the receiver side water layer multiples and the source side water layer multiples from the gather of seismic data traces to generate a plurality of primaries contained in the gather of seismic data traces.

2. (Previously Amended) The method of claim 1, wherein applying the convolutional operator to the gather of seismic data traces to predict the plurality of receiver side water layer multiples comprises:

forming the gather of seismic data traces in a t-x domain;

transforming the gather of seismic data traces from the t-x domain to a tau-p domain; and

convolving the gather of seismic data traces with the convolutional operator to predict the receiver side water layer multiples.

3. (Previously Amended) The method of claim 1, wherein applying the convolutional operator to the second modified version of the gather of seismic data traces to predict the source side water layer multiples comprises:

convolving the convolutional operator with the second modified version of the gather of seismic data traces to predict the source side water layer multiples.

4. (Original) The method of claim 2, wherein the gather of seismic data traces is transformed to the tau-p domain using a linear Radon transform.

5. (Currently Amended) The method of claim [2] 1, wherein adaptively subtracting the receiver side water layer multiples and the source side water layer multiples from the gather of seismic data traces comprises:

adding the receiver side water layer multiples to the source side water layer multiples; and

transforming the sum of the receiver side water layer multiples and the source side water layer multiples from the tau-p domain to the t-x domain.

6. (Previously Amended) The method of claim 5, wherein adaptively subtracting the receiver side water layer multiples and the source side water layer multiples from the gather of seismic data traces comprises adaptively subtracting the sum of the receiver side water layer multiples and the source side water layer multiples in the t-x domain to generate the primaries contained in the gather of seismic data traces in the t-x domain.

7. (Previously Amended) The method of claim 1, wherein removing the water bottom primary comprises replacing each amplitude associated with the water bottom primary with zero.

8. (Previously Amended) The method of claim 5, wherein the sum of the receiver side water layer multiples and the source side water layer multiples is transformed to the t-x domain using an inverse linear Radon transform.

9. (Original) The method of claim 1, wherein the convolutional operator is computed using a zero offset two-way travel time in a water layer and a reflectivity at a water bottom estimated from the water layer model.

10. (Original) The method of claim 9, wherein the convolutional operator is the estimated value of the water bottom reflectivity shifted in time by the estimated value of the travel time in the water layer in the tau-p domain.

11. (Previously Amended) A method for attenuating water layer multiples from a gather of seismic data traces, comprising:

forming the gather of seismic data traces in a t-x domain;

transforming the gather of seismic data traces from the t-x domain to a tau-p domain;

convolving the gather of seismic data traces with a convolutional operator to predict a first set of water layer multiples contained in the gather of the seismic data traces;

adaptively subtracting the first set of water layer multiples from the gather of seismic data traces;

removing a water bottom primary from the gather of seismic data traces;

convolving the convolutional operator with the gather of seismic data traces after the first set of water layer multiples has been adaptively subtracted from the seismic data traces and after the water bottom primary has been removed from the gather of seismic data traces to predict a second set of water layer multiples contained in the gather of seismic data traces;

adding the first set of water layer multiples to the second set of water layer multiples;

transforming the sum of the first set of water layer multiples and the second set of water layer multiples from the tau-p domain to the t-x domain; and

adaptively subtracting the transformed sum of the first set of water layer multiples and the second set of water layer multiples from the gather of seismic data traces in the t-x domain to generate a plurality of primaries contained in the gather of seismic data traces.

12. (Previously Amended) The method of claim 11, wherein the first set of water layer multiples comprises one or more receiver side water layer multiples.

13. (Previously Amended) The method of claim 11, wherein the second set of water layer multiples comprises one or more source side water layer multiples.

14. (Previously Amended) The method of claim 11, wherein removing the water bottom primary comprises replacing each amplitude associated with the water bottom primary with zero.

15. (Previously Amended) The method of claim 11, wherein the plurality of seismic data traces is transformed to the tau-p domain using a linear Radon transform.

16. (Previously Amended) The method of claim 11, wherein the convolutional operator is derived from a water layer model.

17. (Previously Amended) The method of claim 11, wherein the convolutional operator is derived from a zero offset two-way travel time in the water layer and reflectivity at a water bottom estimated from a water layer model.

18-20. Cancelled.

21. (Previously Presented) The method of claim 1, wherein the convolutional operator is derived from a water layer model.

22. (Previously Presented) The method of claim 17, wherein the convolutional operator is the estimated value of the water bottom reflectivity shifted in time by the estimated value of the travel time in the water layer in the tau-p domain.

23. (Previously Presented) A method for attenuating water layer multiples from a gather of seismic data traces, comprising:

forming the gather of seismic data traces in a t-x domain;

transforming the gather of seismic data traces to a tau-p domain;

applying a convolutional operator to the gather of seismic data traces to predict a plurality of receiver side water layer multiples contained in the gather of seismic data traces;

adaptively subtracting the receiver side water layer multiples from the gather of seismic data traces to generate a modified version of the gather of seismic data traces;

removing a water bottom primary from the modified version of the gather of seismic data traces to create a second modified version of the gather of seismic data traces;

applying the convolutional operator to the second modified version of the gather of seismic data traces to predict a plurality of source side water layer multiples contained in the gather of seismic data traces;

adding the receiver side water layer multiples to the source side water layer multiples;

transforming the sum of the receiver side water layer multiples and the source side water layer multiples from the tau-p domain to a t-x domain; and

adaptively subtracting the receiver side water layer multiples and the source side water layer multiples from the gather of seismic data traces to generate a plurality of primaries contained in the gather of seismic data traces.

REMARKS

Applicant files this Second Preliminary Amendment in response to the Examiner's Interview conducted between Examiner V. Taylor and Applicant's representative Jason C. Huang on July 20, 2004. During the interview, the parties agreed to amend claim 5 to depend from independent claim 1.

Respectfully submitted,

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